TRANSPARENT TOUCH PANEL

This is a continuation application of application Ser. No. 08/497,798 filed Jul. 3, 1995, abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a transparent touch panel, which may be attached on display devices such as liquid crystal display panel enabling an operator to input by a pressure with finger or pen while viewing what is displayed on the panel.

There have been various types of panels proposed as the transparent touch panel to be used with electronic apparatus or other equipment; such as the resistance layer type, electro static capacitance type, sensor type, etc.

A standard model of transparent touch panel is described below, referring to drawing. FIG. **1** shows a cross sectional view of the essential part of a standard transparent touch panel. In FIG. **1**, base plate **1** is a 0.1–3 mm thick substrate made of glass or a transparent high polymer, for example, polyethylene terephthalate, polycarbonate, polyacrylate, etc. Top plate **2** is a 0.1–0.5 mm thick substrate made of glass or a transparent high polymer, for example, polyethylene terephthalate, polycarbonate, polyacrylate, etc. On the inner surface of the base plate **1** is a transparent electro conductive layer **3**, and on the inner surface of the top plate **2** is a transparent electro conductive layer **4**; positioned with the electro conductive layer **3** and the electro conductive layer **4** facing to each other. Dot spacers **5** are placed between the base plate **1** and the top plate **2** with a certain interval there between in order to provide a clearance between the base plate **1** and the top plate **2**. The base plate **1** and the top plate **2** are fixed by means of adhesive body **6** made up of an adhesive of epoxy resin or acrylic resin, or a tack agent of polyvinyl alcohol, polyacrylate, etc.

With the above mentioned constitution, the operation of standard transparent touch panel is explained herewith. When the upper surface of top plate **2** is pressed with a finger or a pen, the dot spacer **5** deforms allowing the transparent electro conductive layer **4** placed underneath the top plate **2** to touch the transparent electro conductive layer **3** located on the upper surface of the base plate **1**, and an electric signal is obtained.

Now, in the following, a conventional transparent touch panel is described. In the constitution of a transparent touch panel as shown in FIG. **1**, conventional dot spacers employed a soft silicone rubber material in order to enable the top plate **2** work with a soft touching.

However, the conventional transparent touch panel comprising dot spacers made of a soft silicone rubber material has a problem in durability over a long time of service; namely, during the operating life, the dot spacer itself deteriorates significantly and easily peels off from the plate.

SUMMARY OF THE INVENTION

This invention discloses a transparent touch panel that works with a light touching pressure, and at the same time assures a long operating life.

The transparent touch panel according to this invention comprises a transparent touch panel, wherein a contact position is detected by bringing a pair of plates, having transparent electro conductive bodies positioned thereon facing each other with the dot spacers in between, into contact with each other by a touch pressure. The dot spacers are made of a composite resin, including a flexible modified epoxy resin. It is desirable that the hardness of the composite resin is not more than 95 in terms of Japan Industrial Standard(abbreviated as JIS hereafter), K6301-A.

The modified epoxy resin is created through the chemical reaction of a modified epoxy compound and a curing agent.

As to the modified epoxy compound, the following may be used an epoxy compound modified with a rubber component, for example urethane rubber, polybutadiene, polyisoprene, polyacrylonitrile-butadiene, nitrile rubber, etc.; an epoxy compound modified with polyether; an epoxy compound modified with fatty acid or fatty acid involving conjugated double bond; an epoxy compound modified with polythiol; an epoxy compound modified with silicone resin; and others.

As to the curing agent, there is no special limitation. Compounds that harden through the chemical reaction with the aforementioned compounds may be used. For example, amine compound, amide compound, organic acid compound, acid anhydride compound, etc. may be used as the curing agent.

Besides the above-identified modified epoxy resins, a composite resin including ordinary bisphenol type epoxy resin may also be used.

Further, as to the modified epoxy resins, a composite resin including organic polymer compound may also be used.

In addition to the modified epoxy resins, a composite resin including a filler may also be used.

As pointed out in greater detail below, the use of improved dot spacer having a high degree of elasticity in a transparent touch panel provides important advantages.

Specifically, the input operation or contacting of he bodies can be performed by softly touch-pressing the panel surface with a finger or a pen. At the same time, the amount of pressure applied to the top plate when the plate is pressed to make contact with the base plate is alleviated or lessened resulting in the favorable effect of preventing the breakage of the transparent electro conductive layer placed in the top plate. In addition, because of the higher withstanding capability of the dot spacer against wear, the permanent deformation of the dot spacer after repeated touching is minimized, bringing about a remarkably improved operating durability. On to of the above mentioned advantages, because of the higher adhesion strength of the modified epoxy resin, the peeling off of a dot spacer from a plate is suppressed.

With the constitution according to the present invention, touch panel that realizes the aforementioned advantages all at once may be implemented.

The invention itself, together with further objects and attendant advantages, will best be understood by reference to the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** shows a cross sectional view of the essential part of a transparent touch panel according to this invention.

Explanation of the numerals:

1—Base plate

2—Top plate

3—Transparent electro conductive layer placed on the inner surface of the base plate

4—Transparent electro conductive layer placed to the inner surface of the top plate